

New or remarkable bryophyte records from New Caledonia with special emphasis on Lejeuneaceae

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Abstract – Eight species of liverworts (*Cheilolejeunea incisa*, *Cololejeunea dozyana*, *Drepanolejeunea dactylophora*, *Lejeunea mizutanii*, *Leptolejeunea serrulata*, *Phaeolejeunea amicorum*, *Plagiochila sciophila*, *Spruceanthus thozetianus*) are reported as new for New Caledonia. Species endemic to New Caledonia and hitherto only known from one or very few localities were reported from additional localities. Sporophytes of *Macromitrium larrainii* as well as male plants of *Pogonatum neo-caledonicum* were found for the first time and are described. *Bazzania erosa* is excluded from the bryophyte flora of New Caledonia.

Bryophyta / Marchantiophyta / Lejeuneaceae / mosses / liverworts / new records / New Caledonia / Pacific region

Résumé – Huit espèces d'hépatiques (*Cheilolejeunea incisa*, *Cololejeunea dozyana*, *Drepanolejeunea dactylophora*, *Lejeunea mizutanii*, *Leptolejeunea serrulata*, *Phaeolejeunea amicorum*, *Plagiochila sciophila*, *Spruceanthus thozetianus*) sont rapportées de Nouvelle-Calédonie pour la première fois. Sont également mentionnées de nouvelles localités pour des espèces endémiques de Nouvelle-Calédonie, connues jusqu'à présent d'une seule ou de rares localités. Des sporophytes de *Macromitrium larrainii* ainsi que des plants mâles de *Pogonatum neo-caledonicum* sont décrits pour la première fois. *Bazzania erosa* est exclue de la flore des bryophytes de Nouvelle-Calédonie.

Bryophyta / Marchantiophyta / Lejeuneaceae / mousses / hépatiques / citations nouvelles / Nouvelle-Calédonie / région Pacifique

INTRODUCTION

New Caledonia is one of the biodiversity hotspots and believed to be a rain forest Pleistocene refuge (Pouteau *et al.*, 2015), with a most distinct bryophyte flora. New checklists of the mosses, liverworts and hornworts of New Caledonia were published by Thouvenot & Bardat (2010) and Thouvenot *et al.* (2011). The moss list

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includes 520 and the liverworts and hornworts list 482 species or infraspecific taxa. Endemic bryophytes were estimated to be up to 39%. In comparison with other regions of Oceania the bryophyte flora of New Caledonia can be regarded as well known, although there is little doubt that additions will continue to be made (e.g. Müller, 2011, 2012, 2013; Zhu & Müller, 2012; Thouvenot & Bardat, 2013; Müller & Tan, 2013; Thouvenot & Reeb, 2014; Thouvenot, 2015; Thouvenot & Yong, 2015; Thouvenot *et al.*, 2015).

The first and second author made collections of bryophytes during expeditions to New Caledonia in recent years. Among these collections, a number of species new to New Caledonia or otherwise of interest were found. The list of new species mainly contains members of the family Lejeuneaceae. Voucher specimens of F. Müller are deposited in the herbarium of the Institute of Botany of the University of Dresden (DR) and these of L. Thouvenot in his private herbarium.

NEW SPECIES RECORDS LIST

MARCHANTIOPHYTA

***Cheilolejeunea incisa* (Gottsche) R.M. Schust. & Kachroo**

New Caledonia, Province Nord, Mont Panié, along the hiking trail from the street RPN3 to the summit, epiphytic in rainforest, c. 900 m, 20°35'S, 164°47'E, 14 September 2001, F. Müller NC213A, det. R.-L. Zhu.

Schuster (1980) established *Cheilolejeunea* subgenus *Tegulilejeunea* for *C. excisula* (Steph.) Mizut., a synonym of *C. incisa* (Thiers, 1992). In recent phylogenetic analyses of Cheilolejeuneinae (Schäfer-Verwimp *et al.*, 2014; Ye *et al.*, 2015), this species was not included. The local collection cited above is different from the samples from other areas in the absence of gynoecial innovations. Unfortunately, only a single specimen from New Caledonia is available. A further study of more collections may reveal that it represents a new taxon. *Cheilolejeunea incisa* is the first record for Oceania. The species is widespread in Southeast Asia (Jovet-Ast & Tixier, 1958; Lee *et al.*, 2014; Tan & Engel, 1986) and furthermore known from Australia (Thiers, 1992). A report from Eastern Himalaya (Parihar, 1962) may not be reliable and is in need of confirmation.

***Cololejeunea dozyana* (Sande Lac.) Schiffn.**

New Caledonia, Province Nord, Mont Panié, along the hiking trail from the street RPN3 to the summit, foliicolous in very humid rainforest, c. 900-1300 m, 14 September 2001, F. Müller NC19G, det. R.-L. Zhu.

The species is new for Oceania. The hitherto known range of the species includes Thailand, Malaysia, Borneo, Java, Seram Island, Sumatra, Sulawesi, West Irian, Philippines, China (Taiwan, Yunnan), Nepal, and India [Eastern Himalaya (Sikkim)] (Zhu & So, 1998; Zhu & So, 2001; Zhu & Long, 2003; Eggers, 2006; Dey & Singh, 2011; He *et al.*, 2013).

***Drepanolejeunea dactylophora* (Nees, Lindenb. & Gottsche) J.B. Jack & Steph.**

New Caledonia, Province Nord, Mont Panié, along the hiking trail from the street RPN3 to the summit, foliicolous in very humid rainforest, c. 900-1300 m, 14 September 2001, F. Müller NC19, det. Y.-M. Wei & R.-L. Zhu.

New for New Caledonia. The species is widely distributed in Indomalaysia (Indonesia, Malaysia, southern China, southern Japan, Vietnam, Thailand, and

Philippines) (Zhu & So, 2001). It is also known from Australia (Queensland) (Thiers, 1990; Pócs, 2014), Kosrae in Micronesia (Miller *et al.*, 1983), Fiji (Campbell, 1971), and Madagascar (Pócs, 2011).

***Lejeunea mizutanii* Grolle**

New Caledonia, Province Nord, Mont Panié, along the hiking trail from the street RPN3 to the summit, foliicolous in very humid rainforest, c. 900-1300 m, 14 September 2001, *F. Müller NC19E*, det. Y.-M. Wei & R.-L. Zhu.

New for Oceania. The species was hitherto known from Malaysia (Sabah), Indonesia (Java), Papua New Guinea, and the Ogasawara Islands of Japan (Grolle & Piippo, 1984; Inoue & Iwatsuki, 1984; Lee, 2013).

***Leptolejeunea serrulata* Herzog**

New Caledonia, Province Sud, Mont Mou near Païta: ascent from the sanatorium via Poudio to the summit; foliicolous in mountainous rainforest, c. 1200 m, 10 September 2001, *F. Müller NC2L*, det. L. Shu & R.-L. Zhu

New for New Caledonia. It was known previously from Australia (Pócs & Streimann, 1999), Malaysia (Chuah-Petiot, 2011), Indonesia (Kalimantan, West Irian), Papua New Guinea (Grolle & Piippo, 1984), Thailand (Pócs & Podani, 2015), Vietnam (Jovet-Ast & Tixier, 1958), and Cambodia (Jovet-Ast, 1958).

***Phaeolejeunea amicornum* (Hürl.) Pócs**

New Caledonia, Province Sud, Yaté, Parc de la Madeleine, botanical nature trail, epiphytic, c. 230-250 m, 160°51'E, 22°13'S, 05 December 2010, *K. Reichel NC729*, det. Y.-M. Wei & R.-L. Zhu.

New for New Caledonia. Pócs (2008) considered the species as endemic to the Fiji and Tonga islands at the border of Eastern Melanesia and Western Polynesia in the Southern Pacific.

***Plagiochila sciophila* Nees**

New Caledonia, Province Nord, Ouégoa, Mt Mandjélia, on dead wood in mountain wet forest, 780 m, 5 October 2012, *L. Thouvenot NC1580*, det. L. Thouvenot.

Plagiochila sciophila is widely distributed in Asia, Melanesia and North America and very polymorphic (Inoue, 1984; So, 2001; Heinrichs *et al.*, 2004). The specimen found in New Caledonia is relatively small, unbranched except for stolons at the base of the erect part of the stems. The remote leaves are rectangular with a few ciliate teeth on the upper ventral and apical part. Male shoots have caducous leaves, cut off close to the stem.

***Spruceanthus thozetianus* (Gottsche & F. Muell.) B. Thiers & Gradst.**

New Caledonia, Province Nord, Poya 14 km NE, Grottes d' Adio, limestone massif, epiphytic, c. 200 m, 165°15'E, 21°15'S, 06 September 2003, *F. Müller NC728*, det. X.-Q. Shi & R.-L. Zhu.

The species is not included in the checklist of New Caledonia (Thouvenot *et al.*, 2011). In a key for the determination of the species of *Spruceanthus*, Wang *et al.* (2015) cited the distribution of the species as "known from Australia, India and New Caledonia". The information on the presence of the species in New Caledonia is not cited elsewhere and is based on the specimen cited above. With this we would like to add the record details to the finding. DNA sequences also confirm the determination of the material.

For a long time the species was only known from Australia, but was added recently for India from the southern Western Ghats (Daniels & Daniel, 2009).

NEW LOCALITIES OF ENDEMIC OR RARE SPECIES

MARCHANTIOPHYTA

Acromastigum moratii N. Kitag.

New Caledonia, Province Sud, Yaté, Forêt du mois de Mai, Parc provincial de la Rivière Bleue, ultramafic massif, dead stump, 180 m, coordinate UTM58K: 7553099E, 0672018S, 23 October 2012, *L. Thouvenot NC744*, det. L. Thouvenot. New Caledonia, Province Sud, Sarraméa, Plateau du Dogny, volcanogenic series, soil and rocks in creek bed in mountain rainforest, 1000 m, 15 April 2013, *P. Coulerie COU68*, det. L. Thouvenot. New Caledonia, Province Sud, Sarraméa, Plateau du Dogny, wet rainforest, c. 500 m, 165°49'E, 21°36'S, 09 September 2003, *F. Müller NC771*, det. F. Müller.

This species, described by Kitagawa (1985), is endemic to New Caledonia and so far known only from very few sites as reported in the protologue (Mont Panié, Plateau de Dogny). We report the species from an additional site (Parc provincial de la Rivière Bleue) and rediscovered it in Plateau Dogny.

Acromastigum rigidum R.M. Schust.

New Caledonia, Province Sud, valley at the mine west of Mt Ouin, on open soil in streambed, c. 550-600 m, 166°26'E, 22°00'S, 02 September 2003, *F. Müller NC770*, det. F. Müller.

The species was described by Schuster (1997) and was hitherto only known from the type in Montagne des Sources. It is herewith reported from a second location about 20 km NW of the previous one and also situated in areas with ultrabasic substrata. As the type the newly discovered material is only in sterile condition.

Acromastigum stellare N. Kitag.

New Caledonia, Province Sud, Païta, Mt Dzumac, ultramafic massif, bare soil and rock, c. 900 m, coordinate UTM58K: 7561100E, 0649400N, 18 September 2008, *L. Thouvenot NC152 & NC157*, det. L. Thouvenot. New Caledonia, Province Sud, valley at the mine west of Mt Ouin, slope at a brook, c. 550-600 m, 166°26'E, 22°00'S, 02 September 2003, *F. Müller NC772*, det. F. Müller.

The species was described by Kitagawa (1985) on the basis of material from New Caledonia. He reported the species from Mé Ori, Mont Mou and the Montagne des Sources in Province Sud. Besides the records given in Kitagawa (1985) this endemic species was not reported elsewhere. We reported the species herewith from two additional sites.

Cheilolejeunea xanthocarpa (Lehm. & Lindenb.) Malombe

New Caledonia, Province Sud, Nouméa NNE, Mt Moné near Mt Koghis, epiphytic on shrubs, 1079 m, 09 September 2001, *F. Müller NC68*, det. L. Shu & R.-L. Zhu.

This pantropical species was recently reported as new for New Caledonia by Thouvenot *et al.* (2011) from the Massif du Dzumac. The report above is the second one for New Caledonia.

BRYOPHYTA

Macromitrium larrainii Thouvenot & K.T. Yong

New Caledonia, Province Nord, Mont Panié, along the hiking trail from the street RPN3 to the summit, very humid rainforest, c. 1200 m, 13 September 2001, *F. Müller NC98 & NC202*, det. L. Thouvenot.

The species was just described from the summit of Mont Panié (Thouvenot & Yong, 2015) on the basis of material without mature sporophytes. One of the above cited specimens (Müller NC98) bears sporophytes and the description given by Thouvenot & Yong (2015) can be complemented by the following information.

Setae smooth, light brown, 12-19 mm long. **Capsule** ovoid; urn 1,1-1,5 mm long, 0,6-0,8 mm wide, smooth when moist, weakly plicate when dry, not constricted below the mouth, abruptly contracted to the seta through a short neck; operculum conic, long-rostrate, ca. 1 mm long. Exothecial cells not differentiated in bands, thick-walled, 17-43 μm long, 9-24 μm wide, stomata phaneroporous, numerous (20-36 per capsule) in the neck and in the basal half of the urn, annulus of 1-3 rows of thin-walled, smaller, hyaline cells. Peristome single, exostome teeth 16, densely papillose, erect, inserted ca. 100-130 μm below capsule mouth, 150-220 μm long, ca. 28-40 μm wide. **Calyptrae** conic-mitrate, covering the whole capsule, undistinctly lobed at base, strongly plicate, smooth, 2,7-2,9 mm long, 0,7-0,9 mm wide. Spores not seen.

Pterobryella rigida (Mitt.) Touw

New Caledonia, Province Nord, Touho, Massif des Lèvres, Haute Tipéléi, sedimentary series, on damp rocks of a creek in wet rainforest, 12 October 2012, L. Thouvenot NC761, det. L. Thouvenot. New Caledonia, Province Nord, Hienghène, Tendo, Pwe Huûng, micaschists, on damp rocks of creek bank in wet forest, 7 October 2012, L. Thouvenot NC1647, det. L. Thouvenot.

This species was “poorly known with a very small number of collections” (Bell *et al.*, 2012): Wagap (“Vagap” in Bescherelle, 1878, as *P. vagapensis* Müll. Hal.), Aoupinié, Mt Panié and Dogny (Bell *et al.*, 2012). The Massif des Lèvres was hitherto unexplored by bryologists and turns out to be very interesting.

Pogonatum neo-caledonicum Besch.

New Caledonia, Province Nord, Touho, Massif des Lèvres, Haute Tipiléi, sedimentary series, bare soil, 430 m, 12 October 2012, L. Thouvenot NC1283, det. L. Thouvenot.

Male plant of *Pogonatum neo-caledonicum* remains undescribed to our knowledge (Bescherelle, 1873; Touw, 1986; Hyvönen, 1989).

Description: Male **plant** 4 mm high, bud-like when dry, stem very short with a few appressed vegetative leaves and an apical perigonium, when moist exhibiting a wide splash-cup. **Vegetative leaves** ovate, acute, 1.5 mm long, 1 mm wide; nerve excurrent in a sharp point, entire, more rarely in a mucron or percurrent in an apiculus, margin unbordered, entire or slightly crenulate to undulate at the apex; upper cells irregular short oblong to isodiametric, 10-30 μm long, 10-20 μm wide, thick-walled, chlorophyllose; lower cells irregular, oblong to rectangular, firm-walled, hyaline, 25-75 μm long, 15-25 μm wide, more regular and thinner near the nerve; basal cells elongate; nerve with adaxial epidermal cells rectangular, with a few (up to 5) or none irregular lamellae in upper part. **Perigonial bracts** with rounded apex, the outermost wider, 2.5 mm in diameter, with a medium-thick nerve excurrent in a sharp point, margin entire but slightly crenulate to undulate near the apex; cells as in the vegetative leaves in upper 1/3-1/2, less chlorophyllose, lower cells long hexagonal with lax walls, firmer in the middle part, hyaline; nerve without lamella.

NOTES

***Bazzania erosa* (Reinw., Blume & Nees) Trevis.**

The mention of *Bazzania erosa* in New Caledonia (Meagher, 2015) is erroneous, since the reference is from Espiritu Santo in Vanuatu (Meagher, pers. com.). This species is hitherto unrecorded in New Caledonia.

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